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EU REGIONAL POLICY IN THE LIGHT OF THE NEW ECONOMIC GEOGRAPHY

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Abstract:
This paper looks at the EU regional policy from the perspective of the new economic geography. Firstly the paper studies with reference to the new economic geography under which conditions regional integration entails the risk of widening the economic inequalities between regions. Secondly it is examined which policy design should be chosen when aiming at avoiding interregional income disparities while reinforcing integration. Thirdly it is analysed whether the EU regional policy is - according to the new economic geography - suited for reducing interregional income differentials.

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1 INTRODUCTION

A crucial question connected with European integration is whether deepening integration leads to a "... strengthening of the core regions accommodating modern production sectors at the expense of the peripheral regions retaining only traditional and local activities."[1]. As a consequence of a changing European economic geography income disparities among the European regions could increase. Obviously the European Union policy makers are of the opinion that the European integration widens income disparities between regions: Among other motives they refer to the expected uneven spatial impact of economic integration as a justification for their regional policy interventions.[2] The scepticism of the European Commission concerning the spatial distribution of integration gains is reflected in the amount spent on regional policy. While deepening integration the Structural Funds, which finance the bigger part of regional policy, progressively increased from 3.7 billions in 1985 to 33 billions in 1999 which corresponded to one third of the EU budget at that point in time.

If we look at a justification for policy interventions while reducing barriers to trade and factor mobility from a theoretical perspective, until the late eighties arguments for the European Commission's rather pessimistic assessment concerning the regional distribution of integration gains was hard to find in trade and growth theory. Instead, the 'neo-classical paradigm', which implies that regional integration should lead to convergence, dominated trade and growth theory for several decades. Different from the neo-classical view point two newer theories - the *New Growth Theory*[3] and the *New Economic Geography* - throw doubt on the opinion that integration always is a vehicle for convergence. Those economic approaches suggest that integration may, depending on the concrete circumstances, encourage divergence or convergence.

The theoretical result that regional integration may cause income disparities among regions entails far-reaching policy implications. Out of those this paper discusses what we can learn for regional policy from the New Economic Geography (NEG). The NEG offers a framework for studying the spatial allocation of resources among regions which integrate. Spatial allocation processes among regions which are connected by trade and factor mobility, like in the European Union, should always be the economic relevant background for regional policy. Therefore the NEG is well-suited for regional policy considerations. Since the NEG approach is highly aggregated, it offers only a limited view of the spatial effects of integration. Nevertheless it may be informative for regional policy to point out under which conditions core or peripheral regions may lose or win through economic integration and critically evaluating certain aspects of the European Union regional policy design from this perspective.

The paper is set up as follows. Section 2 resumes key elements of the NEG and presents the NEG model approach of *Ludema/Wooton* (1997) which serves afterwards for discussing the regional policy implications of the NEG. Section 3 firstly examines whether policy interventions are justifiable from a theoretical perspective and how an adequate

regional policy design should look like. Subsequently the theoretical results are linked to the general features of EU regional policy. Section 4 concludes.

2 THE MODEL

2.1 Key Elements of the New Economic Geography[4]

The NEG deals with the spatial distribution of economic activities and offers a framework to study the factors which make economic activities cluster together in a few regions, like in the "Hot Banana" in Europe, while other regions rarely have any.[5] Of course, the shaping of economic landscapes is not a new topic since already the classical regional scientists, like *von Thünen* (1826), *Weber* (1909), *Christaller* (1933) and *Lösch* (1944), analysed related questions.[6] New is the general equilibrium approach of the NEG for explaining the emergence of agglomerations in an otherwise homogenous space. *Krugman* (1991 a, 1991 b) was the first to develop a general equilibrium model of this kind. Within this framework elements from traditional regional science and modern trade theory are combined.[7]

Characteristic for economic geography models are the explicit consideration of space due to interregional transport costs, economies of scale, the microeconomic foundation of centripetal an centrifugal forces and pecuniary externalities, which are the endogenous outcome of market forces. Economies of scale and transport costs cause imperfect competition which is captured by monopolistic competition in the line of *Dixit-Stiglitz*.[8] The peculiarity of this kind of models is their ability to explain the spatial distribution of economic activities by entirely endogenous location decisions.

In his "prototype" NEG model *Krugman* (1991 a, 1991 b) assumes two regions, two production factors and two production sectors. There are economies of scale in the industrial sector which employs labour to produce a differentiated good which is monopolistic competitive and costly traded. In an agricultural sector farmers produce a homogenous good which is perfectly competitive and freely traded. Fundamental for the emergence of industrial concentration are economies of scale due to which the profit maximising manufacturing firms only locate in one region. Under certain assumptions backward and forward linkages promote a self-reinforcing industrial concentration process. The driving force behind this are mobile workers and firms which locate where the market is relatively large. Against this works the immobility of the farmers. The relative weight of the centripetal and centrifugal forces – and therefore the spatial equilibrium structure - crucially depends on the level of the transportation costs, the manufactures' share of total expenditure and the elasticity of substitution among the differentiated manufacturing goods.

Krugman himself and other authors modified the seminal NEG model in various respects. In some model variants additional to immobile farmers different factors in favour of industrial dispersion like non-tradable goods[9] and congestion costs[10] are intro-

duced. But also elements reinforcing industrial clustering, for example vertical linkages between industries[11], are considered. But whether the basic structure of the prototype nor its key mechanisms are questioned by those various modifications. Unfortunately a common feature of most of the model variants is that they are not amenable to analytical solutions and exhibit multiple equilibria. In general numerical examples illustrate the model mechanisms. Therefore, of course, "A sceptic cannot help reading their numerical results as special cases of special cases."[12]. But this critics are not appropriate, since various numerical examples show that the NEG provides general and robust insights regarding the interplay of spatial relevant factors and the impacts of integration on the geographical distribution of economic activities.[13] For working out the regional policy implications of the NEG we refer, for reasons we describe below, to the model variant of *Ludema/Wooton* (1997).

2.2 The Model[14]

There are two homogenous regions A and B and two production sectors, a modern (M) and a traditional (T) one. The traditional sector produces a homogenous good under constant returns to scale and perfect competition. There are economies of scale in the modern sector which produces a wide variety of horizontally differentiated goods under monopolistic competition. Consumers have love for variety and their preferences are described by:

(1) $$U = C_M^{m} \cdot C_T^{1-m} \qquad \text{where} \quad C_M = \left[\sum_{i=1}^{K} c_i^{(s-1)/s} \right]^{s/(s-1)}, \; s > 1.$$

C_T is consumption of the good produced in the traditional sector and C_M is aggregated consumption of goods produced by the modern sector. m denominates the income share spent on goods of the modern sector. c_i is a single product variety of the modern sector. K is the large number of potential product varieties and σ is the elasticity of substitution among those. Transport of traditional goods between the two regions is free of charge. Transportation costs (t)[15] for goods of the modern sector follow *Samuelson's* "iceberg" according to which only $1-t$ units of any unit of good transported between the regions arrive at the destination. Due to transport costs imported product variants are more expensive than locally produced ones.

There are two sector specific production factors which total amount is exogenous. Interregionally immobile unskilled workers are employed in the traditional sector and equally shared between the two regions. The modern sector produces with skilled workers. The skilled workers are mobile between the regions. They are assumed to have different preferences over the location in which they would rather live and work. The individual location preferences enters the model by assuming individual wage discount rates for the wage of the less preferred region.[16] This ends in skilled workers being interregionally mobile on a different. Also perfectly mobile skilled labour is considered. In its mobility scenarios the *Ludema/Wooton* approach deviates from *Krugman* (1991 a,

1991 b) who only refers to perfectly mobile workers of the modern sector. As will be pointed out afterwards, including imperfect mobility has far-reaching implications for the model results and consequently for regional policy.

Regarding the equilibrium some results hold independently of the spatial structure:

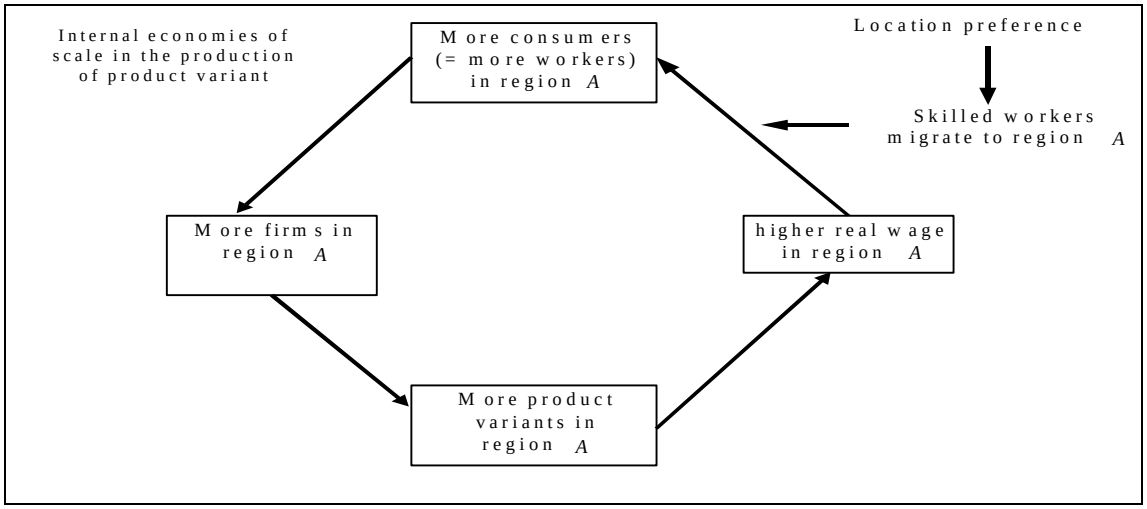
- due to free entry and zero profits in the equilibrium higher product prices are reflected in higher nominal wages;
- due to economies of scale each firm of the modern sector produces only one product variety; each firm produces the same amount;
- the number of firms in one region is proportional to the number of skilled workers in that region; therefore any change of workers located in one region implies a corresponding change of firms in that region;
- each variety of the modern sector is either produced in region A or B;
- consumers always demand each variety, therefore modern goods are traded between the regions.

The price for the traditional good and the nominal wages of the unskilled worker do not differ between the regions when assuming zero transport cost for the traditional sector. Instead, the real and nominal wages of skilled workers may differ interregional and depend on the spatial distribution of economic activities. The regional distribution of firms of the modern sector and the skilled labour is decisive for structure of the spatial equilibrium since the traditional sector is assumed to be immobile. The relative importance of centripetal and centrifugal forces determines the equlibrium economic geography.[17]

Centripetal works the wish of skilled labour to locate where their real income less their individual wage discount rate is the highest. Thus it is ceteris paribus more attractive to locate near the largest local market since regional incomes are the higher the less consumers have to relay on imported goods (which are subject to transport costs). This supports the concentration of the modern sector since the local supply is relatively large where already more firms and workers of the modern sector are located. This so-called *forward linkage* is reinforced by a *backward linkage* since firms of the modern sector also might prefer locating where the local market is relatively large. Agglomeration forces tend to release a self-reinforcing process of industrial concentration. The driving force for industrial concentration is the mobility of skilled labour. In figure 1 region A is supposed to have initially more consumers. This possibly initiates a process of circular causation leading to partial or complete concentration of the modern sector in region A.

Against the centripetal forces works a *centrifugal* force which is the demand of the immobile production factors, i. e. of the unskilled workers and the skilled workers which remain in the periphery. Due to a lower degree of competition in the less populated region firms of the modern sector and skilled workers have under certain conditions an incentive to locate there. Consequently there is a trade-off between being close to the larger market and lower competition in the periphery.[18] The modern sector will only concentrate if centripetal forces dominate the centrifugal force.

Figure 1: Industrial concentration in region *A*



Source: Own diagram.

Due to symmetry it is more or less accidental which region attracts a higher share of the modern sector. If there are initially more skilled workers in one region, this region will attract a higher share of the modern sector.[19] Also it is possible that labour migrates to a certain region since they expect that the other workers will behave in the same way. In this case the expectations concerning the future economic differences between the regions initiate the process of circular causation.[20]

Conditional for concentration of the modern sector is that the real wage is higher in the region where more firms of the modern sector and thus skilled workers are located. Only then more skilled workers may be attracted – assumed their mobility is sufficient - by that region initiating the relative or complete concentration of the modern sector in one region. If instead the real wage would be lower in the region with the higher share of the modern no industrial concentration process will set in since there is no incentive for skilled workers to concentrate in one region. From a theoretical perspective it is – due to counteracting mechanisms – ambiguous which relation holds between regional share of the modern sector and real wage rate. Real wages, which are the quotients of the regional nominal wage and the regional price index, differ among the regions if skilled labour force is unevenly distributed for three reasons.

1. c. p. the higher, the larger the local market is (home market effect),
2. c. p. the higher, the smaller the local market and therefore the regional degree of competition is since a lower competition enables the firms to charge higher prices and pay higher nominal wages (competition effect),
3. c. p. in the region with the relatively large market higher as the income share spent on the less expensive locally produced goods is higher in this region (price index effect).

Obviously the model structure gives reasons for two wage components which are in favour of agglomeration: the home market an the price index effect. In opposite to this the

lower degree of competition in the smaller market encourages the spatial dispersion of economic activities. The net result of the counteracting wage effects crucially depends on the assumptions concerning the exogenous model parameter, i. e. s, m and t, and can only by deducted by numerical calculations. Nevertheless we can draw some general conclusion that a self-reinforcing process of industrial concentration is the more probably[21]:

- the lower t is, because for low t interregional competition is strong since there is only a relatively small price difference between imported and locally produced goods (which weakens the competition effect and supports the market size effect),
- the smaller s is, because in this case locally produced goods are only bad substitutes for the products of the other region (which weakens the competition effect and supports the market size effect),
- the higher is m (which strengthens the price index effect).

From these rather general considerations we turn to discussing the spatial equilibrium. In the long-term spatial equilibrium there are no incentives to migrate for the skilled workers. The migration decision of skilled workers not only depends on the wage difference between the regions but also on the individual willingness to migrate. The stronger the individual preference for one region is, the larger the real wage differential has to be for making him migrate to the less preferred region. Since workers have location preferences not any real wage difference induces interregional migration. Therefore interregional real wage differences may exist in the spatial equilibrium.

Dependent on transportation costs and the willingness to migrate various spatial equilibria are possible (see table 1).[22] A *symmetric equilibrium* describes a spatial structure in which the firms of the modern sector are evenly distributed among the regions. In an *asymmetric equilibrium* there is modern industry in both regions but to a different extent. A *core-periphery* pattern describes a spatial equilibrium in which the whole modern sector is concentrated in one region, the so-called industrial core, while there is only traditional production in the periphery. If there is an symmetric equilibrium no income disparities among the regions exist. Contrary, if there is an asymmetric or a core-periphery equilibrium, nominal as well as real wages for skilled workers are lower in the region where less skilled workers live. Then, despite identical nominal wages for unskilled workers in both regions, the real income of unskilled workers is higher near the relatively large local market, due to lower prices for most products of the modern sector.

Table 1 shows that six out of nine cases are symmetric equilibria. Only if transport costs are low and location preferences are weak - or does not exist at all - migration induced by real wage differences will create a circular causation mechanism (cases 5, 8, 9). A core-periphery structure (case 8, 9) is an equilibrium outcome if skilled labour is perfectly mobile like in *Krugman* (1991 a, 1991 b). If skilled workers are only imperfectly immobile a core-periphery structure is impossible since some of the skilled workers will never leave their preferred region and migrate towards the region where the modern sector is relatively concentrated.

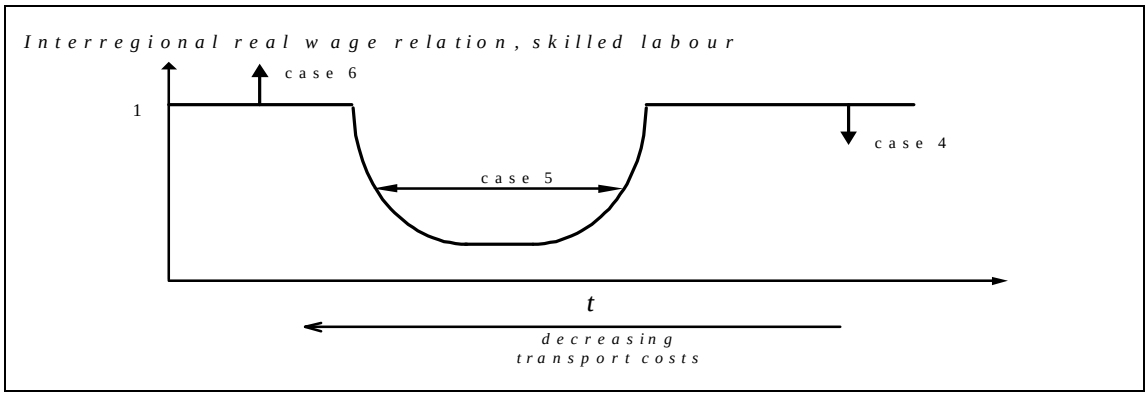
Table 1: Spatial Equilibria , varying transport cots and location preferences*

Transportation costs **Labour mobility**	**High transportation costs**	**Low transportation costs**	**Very low transportation costs**
Little mobile skilled labour (= strong location preference)	**Case 1:** Symmetric equilibrium	**Case 2:** Symmetric equilibrium	**Case 3:** Symmetric equilibrium
High mobile skilled labour (=weak location preference)	**Case 4:** Symmetric equilibrium	**Case 5:** Asymmetric equilibrium; Interregional income disparities, 'u-shaped' relation between transportation costs and inter-regional income disparities**	**Case 6:** Symmetric equilibrium
Perfect mobile skilled labour (= no location preference) **"Krugman's protoype"**	**Case 7:** Symmetric equilibrium	**Case 8:** core-periphery-structure, interregional income disparities	**Case 9:** core periphery structure, interregional income disparities

Source: Own display based on the results of *Ludema/Wooton* (1997). * We do not discuss equilibria for intermediate transportation costs since there are multiple equilibria for this level of transportation costs. **see figure 2.

According to the model mechanisms interregional transportation costs are crucial for the spatial equilibrium. Therefore changes of the transportation costs – may be induced by integration - affect the economic structure under certain conditions extensively. If location preferences are relatively weak the spatial structure may change from a symmetric equilibrium (case 4, table 1) to a asymmetric equilibrium (case 5, table 1) if transport costs fall below a certain threshold. If transport costs continue to fall agglomeration forces become weaker and possibly some of the skilled labour and firms of the modern sector reallocate to the region with less modern industry.

Figure 2: Level of transport costs and interregional wage relation



Causal for the recovering of this region is the incentive for firms to locate there for taking advantage of lower prices for the immobile skilled workers. As a consequence the local market grows and the real wages start to increase. Attracted by the wage increase skilled labour leaves the economic centre until the real wage differences and the different regional share of the modern sector vanishes. Highly stylised the connection between transport costs and interregional real wage difference takes an 'u-shaped' form which captures the non monotonic connection between transport cost and interregional income disparities. [23]

Due to this relation the *Ludema/Wooton* framework *firstly* not only explains the rise of an industrial agglomeration but also its fall. *Secondly* a spatial structure in which the modern sector is interregional unevenly distributed but not completely concentrated in one region is possibly a spatial equilibrium. Those results are more realistic than those of *Krugman's* NEG prototype and plenty of its modifications. Most NEG models predict a complete concentration of the modern sector in one region for low transport costs. Unless trade costs are very high or in the case of zero transport costs centrifugal outweigh centripetal forces. Furthermore the assumption of imperfectly mobile workers is more adequate for analysing the European Union regional policy than approaches assuming perfectly mobile workers.

With regard to its results and the assumption concerning labour mobility we regard the *Ludema/Wooton* model as quite adequate for deriving the regional policy implications of the NEG. It is relevant for regional policy at it gives hints at the spatial effects of integration since we assume that integration affects interregional transport costs by reducing barriers to interregional trade. Of course - despite a more or less realistic mobility assumption – is the *Ludema/Wooton* model like all NEG models highly aggregated and neglects plenty of spatially relevant economic aspects. But the advantage of the model is having quite general implications despite its simple structure. Anyway, more complex NEG approaches, for example models with more than two regions, do not essentially alter the results as the interplay between centripetal and centrifugal remains unchanged.[24]

3 REGIONAL POLICY IMPLICATIONS

In the following the regional policy implications of the *Ludema/Wooton* model are analysed with reference to the European regional policy in three steps. Firstly it is argued that the theoretical framework justifies under certain conditions regional policy interventions on equity grounds. Secondly the adequate measures for realising regional policy motives are discussed from a theoretical perspective. Finally the basic concept of European Union regional policy is critical assessed from the perspective of the NEG.

3.1 Why EU regional policy?

In general, regional policy aims at redistributing income or production factors among regions. Because of its redistribution elements regional policy can only be executed by institutions which, like the European Commission, have power over regions charged as well as favoured by regional policy. Among the most stated justifications of regional policy interventions are efficiency and equity arguments. Regional policy motivated by equity considerations aims at equalising regional per capita incomes. Regional policy on efficiency grounds aims at correction the spatial allocation of resources in order to maximise the whole production of the concerned regions and to avoid welfare losses. Regarding integration processes and regional policy measures on a supranational level another motive joins. In order to promote the acceptance of ongoing integration regional

policy is implemented for compensating regions which temporarily suffer form deepening integration despite welfare gains for the whole integration area. In this case regional policy implies distributive measures in order to ensure the overall welfare gains of integration, i.e. a better supply of goods. Whereby, of course, a clear distinction between the different aims and rationales of regional policy is not possible.

The basis for the regional policy implemented by the European Union has been included in the European Treaties with the Single European Act in 1986, which marked a new orientation of regional policy in the European Union. The rationale for regional policy on the European level goes back to the cohesion objective, which subsumes the political will to encourage social and economic cohesion. The Commission is particularly obliged to support convergence, meaning the reduction of regional disparities, among the regions of the European Union:

> *"In order to promote its overall harmonious development, the Community shall develop and pursue its actions leading to the strengthening of its economic and social cohesion. In particular, the Community shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions, including rural areas (Article 130 a), EC Treaty).".*

Consequently the European Treaties contain a clear obligation for public policies addressed to reducing regional imbalances unless such a reduction is likely to come about automatically and within an reasonable period of time.[25] Furthermore, according to the Commission's assessment regional disparities are not only bad under equity considerations ("... a poorer quality of life ...") but also on efficiency grounds ("... underutilisation of human potential ...):[26]

> *"Imbalances do not just imply a poorer quality of life for the most disadvantaged regions and the lack of life-chances open to their citizens, but indicate an underutilisation of human potential and the failure to take advantage of economic opportunities which could benefit the Union as a whole." (European Commission 1996, p. 13).*

Summarising the attitude of the European Commission we find arguments which fit with distributive as well as with efficiency motives for regional policy in the course of economic integration. Let us firstly analyse whether the NEG, i. e. the *Ludema/Wooton* model, supports regional policy on efficiency grounds. Afterwards we will turn to equity considerations.

Contrary to the Commission's clear-cut view judging about efficiency losses due to a certain economic geography is rather difficult form a theoretical perspective. This is especially true for the NEG framework since it is by no means clear that growing agglomeration reduces efficiency. In the presence of forward and backward linkages the market outcome may lead to inefficiently strong or inefficiently weak agglomeration. Furthermore, for answering the question whether a spatial structure is socially desirable form the perspective of welfare, which should actually be the yardstick of policy interventions, one has to go beyond mere production considerations. But neither *Krugman* (1991 a, 1991 b) nor most of the other NEG approaches offer a welfare analysis. However, a

detailed welfare analysis based on the NEG is hard to do since the formal framework departs from the walrasian competitive paradigm under three main respects:[27]

(a) There are increasing returns and imperfect competition.
(b) With horizontal product differentiation the market equilibrium may over-provide or under-provide varieties.
(c) While choosing a location firms and workers do not take regard of the external impact of their decision on the profit of other firms or on the utility of other workers.[28]

Furthermore the missing welfare considerations go partially back to technical issues.[29] Due to the above mentioned problems the welfare analysis is still a more or less a 'loose end' of the NEG.[30] Agglomeration may be socially desirable form a welfare perspective or not. Therefore the NEG does not generally support nor reject the efficiency motives for reducing regional imbalances uttered by the European Commission. Thus it should be kept in mind, that the Commission cannot think of the kind of economic mechanisms captured by the NEG when referring to efficiency grounds for regional policy. Anyway, since efficiency and welfare aspect are crucial in most spatial models one may wonder on which conceptual framework the Commission's efficiency arguments concerning the spatial distribution of economic activities are based on.

Different from the efficiency aspects the equity implications of a certain economic geography are – at least from a theoretical point of view - definite. The *Ludema/Wooton* approach gives reasons for equity oriented regional policy among integrating regions if integration ends in an asymmetric spatial equilibrium or in a core-periphery structure with corresponding interregional income disparities. The type of the spatial equilibrium depends on the transport cost level and the degree of labour mobility (see table 1). Policy interventions under equity considerations can only be justified if transport costs are low and skilled labour is highly or perfectly mobile (cases 5, 8, and 9, table 1). In an asymmetric or a core-periphery equilibrium the income level is lower in the region with the relatively small market. Since there is no other income than from wages, real wage differences are an appropriate indicator for regional differences in utility. Hence speaking about regional wage differences is equivalent to speaking about regional differences in per capita utility.[31]

Figure 1illustrates that whether reducing transportation costs by an integration step endangers distribution objectives not only depends on the transportation costs and the degree of labour mobility but also on the initial spatial structure, i.e. if there were regional disparities before reinforcing integration or not. If the integrating regions are homogenous and transport costs are ”low enough” and labour mobility is ”high enough”, reducing trade barriers initiates a process of circular causation leading to partial or complete concentration of the modern sector (corresponding to case 5 and 8 in table 1). If a process of circular causation is at work those people with highest mobility will benefit from agglomeration forces by moving to the region with highest real wage rates. However, not all production factors are equally mobile. Thus integration is causal for regional disparities. If instead an asymmetric equilibrium already existed ongoing inte-

gration may support agglomeration or dispersion of economic activities ('u-thesis', see figure 1) when assuming skilled workers to have location preferences. In that case an integration measure may lead to an increase or decrease of regional income disparities. Hence, the model supports only for specific parameter choices the widely spread fear that economic integration at any rate strengthens the economic position of the "rich" regions and weakens those of the "poor" regions. It should be kept in mind that *Krugman's* prototype model leads to different results. When assuming perfectly mobile workers and heterogeneous regions reducing trade costs in the course of ongoing integration always strengthens agglomeration forces.

What does all this imply for regional policy from an European perspective? Summing up it is very difficult to find clear economic rationales in favour of EU regional policy with reference to NEG models. So far efficiency assessments, not to speak of welfare results, based on the NEG are to preliminary for justifying regional policy interventions. Regarding equity motives the *Ludema/Wooton* framework justifies regional policy interventions while reinforcing integration only under certain conditions. Altogether the impact of closer integration on the level of income disparities remains ambiguous. Only if transport costs are low and labour mobility rather high may reinforced integration end in a asymmetric equilibrium marked by regional income disparities among integrating regions. From a theoretical perspective those combinations of transport costs and labour mobility dominate for which political interventions are not necessary on equity grounds (see table 1). Consequently the NEG gives not a general justification for regional policy on equity grounds. But admittedly, the result that the model implies only for three out of nine cases regional policy interventions allows no conclusion about the practical relevance of asymmetric or core-periphery equilibria. The practical relevance of this case is a – still unsolved - empirical question.

3.2 How to affect economic geography by regional policy?

Because of the still unsolved welfare and efficiency discussion we concentrate in the following on adequate policy measures to realise equity motives. Anyway, due to rather ambiguous efficiency effects of integration, equity arguments for regional policy are certainly more powerful than efficiency arguments.

According to *Ludema/Wooton* (1997) changes in the transportability of goods as well as of the factor mobility may affect the location of industry, the spatial allocation of labour and demand, the trade pattern and therefore regional income disparities. The transportability of goods depends on administrative barriers to trade as well as on the interregional traffic and communication infrastructure. The degree of labour mobility is the outcome of administrative migration barriers and the individual location preferences. Consequently, in aim of realising regional policy motives, the model results are primarily relevant for two policy fields. The first is 'integration policy' under which we subsume reducing administrative barriers to trade and labour mobility. The second one is 'infrastructure policy'. To be complete, according to the NEG also building a cur-

rency union is relevant for the economic geography since it affects interregional trade costs due to reducing exchange rate fluctuations.

Concerning *integration policy* theory has firstly implications with respect to the integration intensity. Secondly the model allows conclusions about the advisable sequencing of opening factor and goods markets. Due to the model structure it is helpful to distinguish among heterogeneous and homogenous integration partners while discussion the policy implications. We firstly refer to imperfectly mobile skilled workers.

In the case of heterogeneous regions (regions among which real wages and industrial density differ) an increase of industrial concentration in the course of ongoing integration can be prevented if the critical point of the 'u-curve' – behind which dispersion forces gain importance – is overcome. If the transportation costs are low enough, the periphery gains despite having the smaller market attractiveness due to its lower wage rates. Consequently, when opening the boarders firms have immediately an incentive to settle in the periphery. In this case integration is a vehicle for convergence.

The critical point of the 'u-curve' is the earlier reached the more extensively administrative barriers to trade are reduced. An effective reduction of interregional transport costs gives more importance to the location advantage of the peripheral regions which are lower nominal wages for skilled workers. Being located near the larger market does not matter that much if transport costs are low. On the contrary, if barriers to trade are only reduced on a low scale, persistent – may be large - interregional real wage differences are possible. Consequently an integration policy of "big steps" is advisable on equity grounds in order to initiate a partial reallocation of the modern sector to the periphery. Admittedly, the recovering of the peripheral regions by ongoing integration can only be successful if the quality of the interregional infrastructure is sufficient for low priced transport of goods.

Furthermore, agglomeration tendencies can be avoided by sequencing the opening of labour and good markets when regions integrate.[32] If only barriers to trade are reduced while interregional movement of labour is still restricted, the legally forced immobility of skilled workers prohibits an increase of industrial concentration in the core region and therefore further divergence of real wages. Instead, if the reduction of administrative barriers to trade had already led to a strong decrease of transport costs, the opening of the labour markets is in favour of convergence. For low transport costs the opening of labour markets among heterogeneous regions gives an incentive for a regional dispersion of firms of the modern sector. Hence the model results imply that if heterogeneous regions integrate the integration intensity as well as the sequence of opening factor and goods markets can be implemented for realising distributive regional policy motives.
Also in the case of homogenous integrating regions the rise of an asymmetric equilibrium and its corresponding wage differentials can be avoided by the design of the integration policy. Theoretically a direct transition from a symmetric equilibrium with high transport costs (case 4, table 1) to a symmetric equilibrium with very low transport costs

(case 6, table 1) is possible, both indicating no real wage differences. If the integration steps are large enough, agglomeration tendencies in favour of one region can be avoided. Concerning the timing of factor and goods market opening the same implications for integration policy as for heterogeneous regions holds. If the level of transport costs in principle favours agglomeration a simultaneous opening of factor and goods markets may lead to spatial differentiation which endangers spatial equity. This can be avoided if firstly only trade is liberalised.

The model implications concerning integration policy in aim of equity can be summarised as follows. An extensive reduction of barriers to trade, which is temporarily accompanied by a mobility policy which takes regard of the level of transport costs, is suited for reducing interregional income disparities. In the case of homogeneous integration partners the rise of income disparities can also be avoided by that kind of integration policy. Nevertheless, an extensive reduction of administrative barriers to trade may not be sufficient for encouraging industrial dispersion. For a given level of administrative barriers to trade the transportability of goods depends on the quality of the interregional infrastructure. Therefore infrastructure policy, especially concerning interregional traffic and communication infrastructure, is a potential policy field for promoting regional equity.

On of the strong messages of the *Ludema/Wooton* model for policy considerations is that an asymmetric equilibrium with corresponding income inequalities must not be persistent. Rather the spatial distribution of economic activities may be influenced by policy measures. Causal for the non-monotonous relation between transportation costs and interregional income disparities are *imperfectly mobile skilled workers*. Instead, when assuming *perfectly mobile skilled workers* (like in *Krugman's* prototype), decreasing transport costs do not reduce the concentration of firms in the centre. In these models there is a threshold of transportation costs below which the agglomeration mechanisms takes place and is self-sustaining even for continuously decreasing transportation costs.

3.3 NEG Implications for EU regional policy design

At present Europe's economic geography can be described as an core-periphery-structure on a large scale. The richest regions of the EU are concentrated in the north western part of the continent. At the periphery of Europe we find those countries with lowest GDP which are Ireland, Greece, Spain and Portugal to which can be added the southern part of Italy.[33] Form this point of view geography matters a lot for economic conditions! Thus, facing the present economic geography of the European Union, we have to ask in terms of the NEG whether EU regional policy is suited for affecting the economic geography in such a way that peripheral regions gain modern economies of scale industries. As an outcome of this income disparities between peripheral and central regions would decrease – a development meeting the aim of EU regional policy. The background for this mechanism is a possibly non monotonic relation between transportation costs and interregional real wage differences (see figure 1). Anyway, if

industrial agglomeration were irreversible (like, for example, in *Krugman* 1991 a) we should not think about regional policy directed to industrial location decisions but of interregional redistribution by pure financial transfers.

NEG suggest two ways through which policies can have an impact on the location of modern firms and skilled labour and thus on regional convergence: Integration and infrastructure policy can both help to fulfil regional policy objectives. Although it is a result of the model that the design of integration policy may affect regional policy it is irrelevant in our context since among the current EU member states no more administrative barriers to trade and factor movement exist.[34] Of course, integration policy is of highest interest in view of the EU enlargement. But we will not discuss this aspect in this paper. Instead we concentrate on regional policy of the past and at present directed towards the interregional allocation of resources among the current EU member states. Admittedly the NEG is very stylised and therefore not suited for a detailed analysis of the various EU regional policy programmes.[35] Nevertheless, NEG models allow assessing the basic approach of the EU regional policy.

The basic feature of EU regional policy[36] is financial assistance for 'lagging' regions, mainly from the Structural Funds, which are in the actual planning period from 2000 to 2006 equipped with about 195 billion Euro. The Structural Funds are concentrated on financial aid for regions with an income less than 75 % of the EU average income which stresses the strong income orientation of the EU regional policy. For example in the planning period from 1994 up to 1999 about 70 % of the Structural Funds flew towards relatively low income regions. Subventions financed by the Structural Funds are concentrated on three fields. Presently 30 % of the Structural Funds are spent on *investment in infrastructure*, mainly on transport infrastructure as well as telecommunications and energy. Another 30 % of the Structural Funds are budgeted for *investment in human capital*, including labour market policy. 40 % of the structural funds finance *subsidies to industry*. Regional aid therefore tends to be concentrated on investment and is meant to increase economic activity in designated regions.[37] Additionally infrastructure and environmental projects in Greece, Ireland, Portugal and Spain are financed by the cohesion fund. From 2000 to 2006 the financial amount of the cohesion fund is 18 billion Euro.

NEG has direct implications concerning *investment in infrastructure* financed by EU regional policy. The Structural Funds and the Cohesion Fund put heavy weight on transportation infrastructure, in order to promote Trans-European axis, to connect peripheral regions to the Trans-European networks and to facilitate the international transit. The emphasis on physical infrastructure in order to promote regional development is a longstanding Commission viewpoint.[38] This emphasis is justified in part on the grounds that disparities in infrastructure in the EU are greater than in incomes.[39] The Commission believes that infrastructures, especially transport and telecommunication, are major tools to promote regional convergence.[40] But, concerning infrastructure policy, the NEG sends a different, rather sceptic message. If one assumes the 'u-shape' relations there are no definite results concerning the impact of declining transportation

costs on the economic geography and thus on convergence. Declining interregional transportation costs may strengthen agglomeration or dispersion forces. Thus income disparities among centre and periphery could increase or decline when improving interregional infrastructure. Therefore – to speak in terms of the NEG - a crucial problem connected with infrastructure policy is, that an exact determination of the critical point of the 'u-curve', at which convergence is supported by reducing transportation costs, is impossible. For such an assessment we have to know whether transport costs after improving infrastructure are high, low or extremely low. Since no adequate indicator for transportation costs exists any judgement about the level of transportation costs is more or less speculative.

The theoretical results are even more pessimistic since infrastructure investment may not only fail to support convergence but could strengthen divergence which would be diametrical to regional policy motives. Inter-regional infrastructure financed by the Structural Funds or by the Cohesion Fund may have the unintended effect of attracting firms from the European periphery to the central regions. This is due to one of the key mechanism of the model: Facilitating inter-regional trade is like removing trade barriers which protect firms located in the periphery from interregional competition. The relative monopolistic power of firms in the periphery – ensured by the natural protection by transportation costs - decreases if the interregional transportability of goods improves. Then the competition effect (see page p. 6) loses importance and the incentive to locate near the largest market gains dominance. As an outcome of this the current European core-periphery-structure could be strengthened by declining trade costs. In the course of this the spatial concentration of modern industries in the core of Europe could increase whereas the periphery would specialise in constant returns to scale industries, like for example agriculture and low technology industries.

This rather sceptical message gets even worse if, by modifying the *Ludema/Wooton* model, it is differentiated between intra- and interregional infrastructure investment. *Martin/Rogers* (1995) show that investment in intra-regional infrastructure contributes to convergence. Instead, only improving interregional while leaving intra-regional infrastructure as it is always strengthens regional disparities. As an example for the negative influence of interregional infrastructure on the economic performance of peripheral regions it is often referred to the Italian Mezzogiorno. It is argued that the improvement of the Italian traffic infrastructure, mainly financed by EU programmes, worsened the chance to catch up for the Italian periphery.[41] Without having had a profound industrial base and a sufficiently large market while facing similar wage structures than in the north the southern firms lost out to northern competitors. In this case improving infrastructure was like removing the south's natural protection from northern Italian competitors.

It should be emphasised that the theoretical result that infrastructure policy may have the unwanted effect of supporting regional disparities does not imply that infrastructure policy is always bad from an equity perspective. Crucial for the effect of infrastructure

policy is its extent since the unintended effect of regional policy may not be expected for all levels of transport costs. Thus, when transport cost are already low an ongoing infrastructure improvement may help convergence. With very low transport costs location is mainly determined by factor market competition and less by differential in local expenditures. In this case firms have an incentive to relocate in regions where labour is relatively cheap and infrastructure policy in search for convergence could be successful.

Altogether there is a danger of strengthening regional inequalities by a wrong ”dosage” of infrastructure policy measures conducted by the EU infrastructure programmes. Thus, when having in mind the NEG, it is allowed to doubt the effectiveness of the EU regional policy strong concentration on infrastructure in search for convergence. All in all, due to the still outstanding theoretical support regional policy concentration on infrastructure should be critically reviewed. Furthermore it should not be ignored by policy-makers than any improvement of interregional infrastructure will not have a sufficient impact on interregional transport costs (and thus on interregional income disparities!) if trade impediments due linguistic and cultural differences - despite having removed administrative barriers to trade – are still large among the European regions.

Different from infrastructure policy the NEG model gives no direct hints at the spatial effects of investment in human capital and subsidies to industries, which are also important policy fields of EU regional policy. But in the context of the NEG we find another spatial relevant aspect which is not a direct objective of the Structural Funds nor of the Cohesion Fund but related to all programmes. This is the fact that interregional financial transfers – which are quantitatively not negligible - affect market size and purchasing power in the designated regions. Interregional financial transfers have both a direct and an indirect effect on interregional disparities. Firstly, redistributing income towards poorer regions is a direct income transfer to poorer regions supporting convergence. Secondly, regional purchasing power increases when receiving financial transfers. As the market size – and the corresponding expenditure level - is the main force driving the location choices of modern industries a declining interregional expenditure gap should give an incentive for firms and workers to relocate towards the region with increasing expenditure.[42]

Let me give some concluding remarks concerning the efficiency objective of EU regional policy programmes. In standard models the efficiency aspect is not clear. More agglomeration may desirable or not from the aspect of overall efficiency. So, when referring to the NEG, i.e. to the *Ludema/Wooton* (1997) framework, the efficiency argument for regional policy conducted by the European Union is by no means convincing. The economic theory does not support the Commission’s idea that a core periphery structure of economic activities is unambiguously bad from an efficiency point of view. As long as efficiency implications of a certain economic geography are rather vague EU regional policy in search of efficiency is to reject from the theoretical perspective of the NEG. Possibly those regional policy interventions reduce efficiency rather than enhancing it. If a spatial allocation is socially desirable policy interventions under cir-

cumstances induce welfare losses. Different from this the Commission is of the opinion that an equity-efficiency trade off of regional policy does not exist.[43]

4 CONCLUSIONS

The aim of the paper was firstly to show what we can learn for regional policy in the course of integration from the NEG models. Secondly it was analysed what the theoretical results imply for the EU regional policy in aim of the cohesion objective and under efficiency considerations. Of course the NEG is only one theoretical approach for examining the spatial effects of integration. But since no overall framework exists for dealing with spatial economics we have to rely on those kinds of partial analysis when thinking about the impact of integration on the economic geography. Despite being aware of the highly stylised approach of the NEG and its shortcomings, we can, nevertheless, draw some conclusions form the issues captured by this paper. Those concern the spatial effects of integration on the one hand and their regional policy implications on the other.

It is still an unanswered question if deepening integration will strengthen the present core-periphery-structure within Europe and consequently income disparities among the European regions. Also according to the NEG model developed by *Ludema/Wooton* the spatial impact of economic integration is ambiguous. Depending on the circumstances integration may support divergence or convergence. Whereas convergence is the more probably the deeper integration and thus the lower transportation costs are. The theoretical uncertainty concerning the spatial effects of integration is due to the non-monotonous relation between agglomeration forces and the transportation costs which is captured by the 'u-curve'. Where we stand in this figure is an empirical question of utmost importance about we did not speculate in this paper as our considerations are meant to be theoretical. Despite unsolved empirical - and also theoretical - questions the NEG is already now informative for policies since it gives new insights about valid and non-valid justifications of regional policy.[44] Furthermore it allows some guesses concerning regional policy measures.

Regarding regional policy motives the model does not support policy interventions on efficiency grounds since the efficiency implications of NEG models are still too vague. From an equity perspective we can find arguments supporting EU regional policy if integration ends in an asymmetric equilibrium marked by regional income disparities. But this must not be the outcome of integration. If integration entails convergent or divergent development depends on the level of transportation costs and the degree of labour mobility. This is a rather interesting result from a theoretical perspective and from the view of regional policy in practice for at least two reasons. Firstly, the possibility of divergence stands in strong contrast to the neo-classical paradigm according to which integration always ends in convergence. Secondly, the theoretical possibility of convergence due to integration is contrary to the popular and also from EU policy makers supported thesis that integration always gives reasons for regional policy on equity

grounds. Indeed the *Ludema/Wooton* approach may underestimate the possibility of convergence due to the fact that it only includes one centrifugal force.

Due to theoretical ambiguity concerning the spatial effects of declining transportation costs judging about the design of the EU regional policy, i. e. its infrastructure programmes, is difficult. However, the theoretical results by no means support the belief that infrastructure policy is a panacea for regional income disparities. The Commission's view that infrastructure in the peripheral regions without doubt is beneficial to them and supports the reduction of income disparities is not supported by the NEG. Only if transport costs are sufficiently low the improvement of transport infrastructure is an adequate tool for reducing regional inequalities. If investment in infrastructure does not entail an extensive reduction of interregional transport costs EU infrastructure programmes may support agglomeration tendencies and income disparities. This outcome would be diametrical to the objective of the European Union regional policies. Thus it is for the benefit of the low income regions – corresponding to the periphery of the European Union - that interregional transportation costs decline "far enough" while integrating. Concerning the efficiency objective of the Structural Funds the NEG offers no arguments supporting the Commission's approach. Anyway, simultaneously tracing efficiency and distributive objectives, like the European Union does, is problematic.[45]

Summing up the results, from the perspective of the NEG arguments in favour of the European Union's regional policy approach are weak. This holds for the motivation of regional policy as well as for the policy measures. In view of those findings it is only consequent to question the general approach of EU regional policy concerning the policy design as well as its explicitly formulated objectives. In view of the impending EU enlargement, in the course of which problems of income disparities reach a new dimension, rethinking the EU regional policy approach should undoubtedly on the agenda.

ENDNOTES

[1] See *Ottaviano/Thisse* (1999), p. 1.
[2] See *Begg/Gudgin/Morris* (1995), p.1.
[3] The New Growth Theory goes back to the work of *P. Romer* (1986, 1990). The advanced textbooks of *Grossman/Helpman* (1991) and *Barro/Sala-i-Martin* (1995) survey the New Growth theory.
[4] *Fujjta et. al.* (1999) summarise the state of the art.
[5] Since it is often mixed up it should be mentioned that the NEG models do not deal with industrial specialization issues which for example are considered in *Krugman/Venab*les (1996). The policy implications of changing industrial specialization patterns are discussed in *Puga* (1998) and *Krieger-Boden (1999)*.
[6] See *Kopp* (1999) for a comparison between NEG and approaches of the "founders" of regional economics.
[7] The key element of those theorie are discusses in *Krugman* (1993) und *Brülhart* (1998), p. 777-779.
[8] See *Dixit-Stiglitz* (1977).
[9] See *Helpman* (1995).
[10] See *Junius* (1999).
[11] See for example *Puga* (1999), *Junius* (1996) and *Venables* (1996).
[12] See *Ottaviano* (1999), p. 3.
[13] See *Ottaviano* (1999), p. 9.
[14] We only refer to the basic model elements. For an extended version of the model see *Ludema/Wooton* (1997). Deviating from *Ludema/Wooton* (1997) we do not speak of an "agricultural" and an "industrial" sector but, like *Ottaviano/Thisse* (1999), of a "modern" and a "traditional" one. Due to our opinion this modification gives more room for interpreting the model results.
[15] Transportation costs subsume all costs related to any kind of impediments to trade between regions. Some of these costs are due to the existence of distance (e. g. physical transportation costs), others arise from institutional barriers (e. g. tariffs or quality and safety standards) or even from linguistic and cultural differences (see *Ottaviano* (1999), p. 3).
[16] Locational preferences and the corresponding wage discount rates are describeb by a density function. Strong locational preferences entail a high wage discount rate and low labour mobility (see *Ludema/Wooton* (1997), p. 8 ff).
[17] The model is static and lacks any explicit dynamics. However, for understanding the key mechanisms of the NEG it is helpful to think about the adjustment processes among different spatial equilibria. The spatial equilibria can be calculated by solving a system of equations for nominal and real wages, the relation between expenditures for locally produced and imported product varieties for given values for m, s, t as well as given regional distribution of labour.
[18] See. *Krugman* (1991 b), p. 491. and *Junius* (1996), p. 9.
[19] See *Krugman* (1991 b), p. 497.
[20] See *Krugman* (1991 a), p. 29 ff and *Junius* (1996*)*, S. 35 ff.
[21] Those conclusion result from numerical examples.
[22] In the following we neglect the influence of a varying elasticity of substitution and income share of modern goods on the spatial equilibrium since we consider the transport costs and the labour mobility to be more interesting for our policy analysis. Of course the denomination of the level of transport costs is arbitrary. We follow *Ludema/Wooton* (1997), p. 11.
[23] In a different NEG model *Puga* (1999) also derives a non-monotonic relationship between transportation costs and real wage differences. He attaches importance to the ‚u-curve' because of the empirical investigations of *Hanson* (1998) and *Brülhart/Torstensson* (1996).
[24] See *Fujita et. al.* (1999), p. 94-95 and *Schmutzler* (1999), p. 366.
[25] See *R. Martin/Schulze Steinen* (1997), p. 19.
[26] See *Ottaviano/Thisse* (1999), p. 1.
[27] See *Ottaviano* (1999), p. 17.
[28] In the presence of externalities private welfare optimisation is no longer equal to social welfare optimisation (see *Martin* (1998), p. 72). I. e. a skilled worker's decision to locate near the larger market is not influenced by the possible negative welfare effects of the immobile factors remaining in the periphery.
[29] Since the NEG models refer to a nested CES demand system for which the marginal utility is not constant between agents with different endowments it is not really suited for judging about the efficiency of different endowments (see *Ottaviano/Thisse* (1999), p. 4).

[30] First hints regarding welfare implications of NEG models can be found in *Ottaviano/Thisse* (1999) Their essential result is that market outcome is socially desirable when transport costs are either high (implying a symmetric spatial structure) or low (implying a core-periphery structure). By contrast, for the intermediate values of these costs, the market leads to the agglomeration of the modern sector whereas it is socially optimal to keep it geographically dispersed (see *Ottaviano/Thisse* (1999), p. 4).

[31] See *Bröcker* (1995), p. 29.

[32] See *Ludema/Wooton* (1997), p. 17-18.

[33] See *P. Martin* (1998), p. 761.

[34] Of course factor mobility and trade are not only restricted by administrative barriers. Also cultural and linguistic differences among regions affect the transportability of goods. Those aspects reveal further policy fields. Since those rather have a national than a regional level we will not discuss them here Furthermore, the importance of non-tariff barriers of trades vanishes if regions integrate but even if regions have a common market non-tariff barriers to trade might still be high.

[35] For a detailed discussion of EU regional policy see *R. Martin* (1999).

[36] In addition to the regional policy there are some more policy fields which are of special regional relevance like competition policy and the idea of an European spatial development concept (EUREK) but those policy fields are not European regional policy in its original meaning of redistributing ressources among regions. *Wößmann* (1999) discusses those policies from the view dynamic spatial economics.

[37] See *P. Martin* (1998), p. 758.

[38] See *Begg* (1995), p 4-6.

[39] See *P. Martin* (1998), p. 753.

[40] See *P. Martin* (1998), p. 753.

[41] See *Puga* (1998), p. 4.

[42] The same arguments can be found in *P. Martin* (1998), p. 766.

[43] *Ottaviano/Thisse* (1999) derive in shlightly modified model variant of *Krugman* (1991 a, 1991 b) that it is by no means clear that agglomeration is always socially undesirable. Rather they show that their is an equity-efficiency trade-off when transport costs are either high or low.

[44] See *Bröcker* (1997), p.

[45] See *P. Martin* (1998), p., *P. Martin* (1999), p. and *Ottaviano/Thisse* (1999), p. *P. Martin* (1999) argues that EU regional policies face a trade-off between equity and efficiency at the spatial level. He is of the opinion that "European policy makers may have asked to much from regional policies: to decrease inequalities between regions, to increase efficiency at the national and European levels and to decrease inequalities between countries." (see *P. Martin* (1999), p. 10).

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